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## INFLAMMATORY OSTEOARTHRITIS—I. THE CLINICAL SYNDROME\*

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### INTRODUCTION

THE TERM, inflammatory osteoarthritis, is not intended to supplant standard terms for multilocus osteoarthritis. Rather, it attempts to focus on an abrupt and painful mode of onset of these various forms of osteoarthritis. It is unlikely that osteoarthrosis developing gradually and painlessly, even if in various sites, will be confused with the inflammatory arthritides, such as rheumatoid arthritis and gout. It is even less likely that such confusion will occur between degenerative joint disease of one or two major joints and a symmetrical polyarthritis. The abrupt painful polyarticular onset, with an emphasis on small joints of the hands, which characterizes the clinical picture of several seemingly similar forms of osteoarthritis along anatomic lines *can* lead to such confusion, and makes the introduction of another term, namely inflammatory osteoarthritis, germane.

The end product of osteoarthritic involvement of the small joints of the hand is remarkably similar. Nodose enlargements develop, called Heberden's nodes at the distal interphalangeal joints, and by some, Bouchard's at the proximal interphalangeal joints. European clinicians, in particular, regard involvement of the interphalangeal and metacarpophalangeal joint of the thumb as a related disorder known as rhizarthrosis [1].

At times, this nodose form of arthritis begins abruptly and painfully, with dramatic redness overlying the involved joints. After a course of variable duration, commonly lasting from several months to approximately five years, the symptoms gradually subside, leaving behind deformities indistinguishable from the less acute classic variety. Heberden and Haygarth, in the 19th century, described the nodose deformities, and Archibald Garrod [2] grouped these with simultaneous involvement of the other joints, anticipating the modern description by Kellgren and Moore [3] of primary generalized osteoarthritis. To Garrod's time, this syndrome was regarded as a benign

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variety of rheumatoid arthritis; only in the present century was it recognized as ultimately osteoarthritic, and most authors related it to menopause (menopausal arthritis). Some referred to mixed arthritis, implying simultaneous osteoarthritis and rheumatoid arthritis.

Stecher [4] elucidated a hereditary pattern that apparently underlies painless Heberden's and Bouchard's nodes. Subsequently, Crain [5] introduced the term interphalangeal osteoarthritis, and Peter and his collaborators [6] coined the name, erosive osteoarthritis, because of the erosions that underlie some of the instabilities and deformities of finger joints. In an earlier paper [7], I emphasized the distribution of these lesions on the radial aspect of the hand, the marked redness of the overlying skin, the relationship of hormonal changes, and a more frequent involvement of metacarpophalangeal joints than usually conceded. The current study attempts to correlate the various manifestations.

#### MATERIALS AND METHODS

The patients personally seen in consultation and subsequently followed at the Arthritis Center of the Albert Einstein Medical Center between 1 January 1966 and 31 December 1970, formed the study population. The entire group numbered 1446 patients, and the predominant diagnoses were rheumatoid arthritis, peritendinitis/bursitis, degenerative joint disease, and inflammatory osteoarthritis, as defined above. Each patient for whom the diagnosis of inflammatory osteoarthritis was recorded had to satisfy basic clinical criteria: the onset was abrupt and painful in the small joints of the hands; nodose enlargement of these joints developed; there was no evidence or history of psoriasis; on further observation, osteoarthritis alone remained a tenable diagnosis; laboratory data failed to point to other possible rheumatic diseases; and roentgenographic evidence of osteoarthritis developed in the appropriate joints. Sex, age, age at onset, duration of active disease, family history, morning stiffness, and duration and distribution of such stiffness were recorded for each patient diagnosed as having inflammatory osteoarthritis. Each joint was separately scored, and presence or absence of mucoid cysts noted. History of estrogenic or other hormone therapy was obtained, as well as data on natural or surgical menopause, and details of medical and physical treatment, intra-articular injections, and surgical intervention. Details of roentgenographic and laboratory studies were recorded.

#### RESULTS

Of the 1446 patients studied, 170 had inflammatory osteoarthritis and 337 classic or definite rheumatoid arthritis. In our population, there were thus two cases of rheumatoid arthritis for each case of inflammatory osteoarthritis.

There were 167 women and 6 men who presented with the syndrome of inflammatory osteoarthritis. All the men were over 60 yr of age at the time their symptoms began.

The mean age of the patients who had inflammatory osteoarthritis was 60.8 yr, with a standard deviation of 10.9 yr. Mean age at onset was 50.5 yr. Duration of active disease was sometimes difficult to determine, because, though the onset was abrupt, the course was characterized by gradual diminution of symptoms; median duration of active disease was 93.5 months. Some patients were seen in the initial stages of the disease, others long after cessation of all pain, though deformities remained. Sixty-eight per cent of the patients related a family history of this condition.

Seventy-six per cent claimed morning stiffness, with a mean duration of one-half hour.

Distribution of involvement in the joints of the hand is listed in Table 2 and schematically portrayed in Fig. 1. Table 1 also lists other joints frequently involved in the syndrome.

TABLE 1. JOINT INVOLVEMENT IN 170 PATIENTS. PERCENTAGE IN PARENTHESES

	5	4	3	2	1	1	2	3	4	5
DIP	127 (75)	124 (73)	123 (72)	132 (78)	IP (49)	IP (60)	141 (83)	127 (75)	122 (72)	135 (79)
PIP	88 (52)	88 (52)	84 (49)	86 (51)	49 (29)	60 (35)	90 (53)	89 (52)	87 (51)	85 (50)
MCP	3 (02)	4 (02)	11 (06)	19 (11)	41 (24)	47 (28)	22 (13)	13 (08)	3 (02)	2 (01)
CMC					62 (36)	63 (37)				
Hip				28 (16)				24 (14)		
Knee				69 (41)				65 (38)		
Cervical spine				Left		46 (27)		Right		

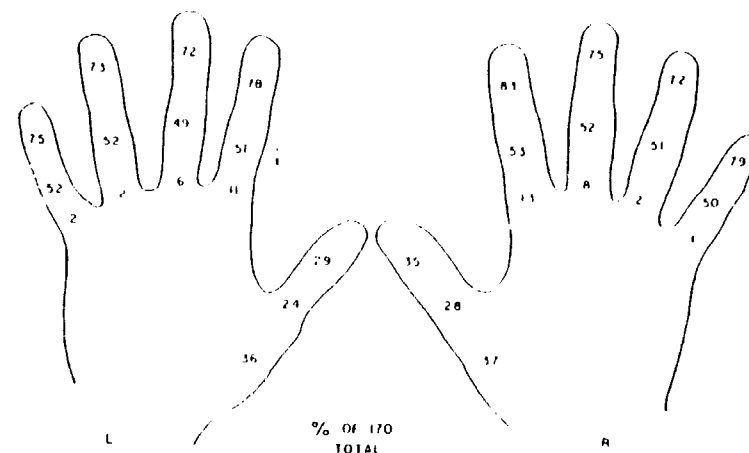


FIG. 1. Joints of the hand involved by inflammatory osteoarthritis (per cent of 170 patients).

The correlation matrix was obtained for all the variables, and the results are set forth in Tables 2 through 4.

Only 9 per cent of the patients developed mucoid cysts overlying involved joints. Sixteen per cent of the patients suffered a modest degree of interference with the activities of daily living, generally of a transient nature. This incapacity was most frequently the result of interphalangeal or metacarpophalangeal joint involvement of the right thumb, or of the first right carpometacarpal joint; involvement of the interphalangeal joint of the left thumb was responsible for disability in only half as

TABLE 2. COEFFICIENTS OF CORRELATION (PEARSON PRODUCT MOMENT R.) IN 170 PAIRS OF HANDS. IN THIS METHOD, VALUES ABOVE 0.40 ARE SIGNIFICANT AT THE 0.001 LEVEL OF CONFIDENCE; THE PROBABILITY TO OBTAIN THIS RELATIONSHIP BY CHANCE IS LESS THAN 1 IN 1000. AT 0.75, THE RELATIONSHIP IS CLOSE TO LINEAR, AND CHANCE IS PRACTICALLY ELIMINATED. ACCORDINGLY, WHEN ONE DISTAL PROXIMAL INTERPHALANGEAL JOINT ON A HAND IS INVOLVED, ALL THE OTHERS ARE LIKELY TO BE INVOLVED ALSO

	Right	Left
DIP 2 3	0.71	0.77
2 4	0.55	0.73
2 5	0.50	0.63
3 4	0.75	0.75
3 5	0.50	0.72
4 5	0.65	0.84
PIP 2 3	0.75	0.81
2 4	0.73	0.76
2 5	0.75	0.72
3 4	0.81	0.72
3 5	0.72	0.72
4 5	0.81	0.76
MCP 1 2	0.27	0.23
2 3	0.75	0.74

TABLE 3. COEFFICIENTS OF CORRELATIONS (PEARSON PRODUCT MOMENT R.) AMONG SELECTED JOINTS IN 170 PATIENTS. VALUES ABOVE 0.40 ARE SIGNIFICANT AT THE 0.001 LEVEL OF CONFIDENCE. WHEN INTERPHALANGEAL JOINTS ARE INVOLVED IN ONE HAND, SO WILL THEY BE IN THE OTHER. SIMILAR CONCORDANCE OBTAINS FOR SPECIFIC MCP JOINTS (E.G. 1 RIGHT WITH 1 LEFT, 2 RIGHT WITH 2 LEFT, ETC.), CMC JOINTS, KNEES, AND HIPS. THE DISEASE IS THUS SEEN TO PRODUCE SYMMETRICAL SYMPTOMS

Right	1	2	Left 3	4	5
DIP 2		0.77	0.66	0.53	0.60
3		0.82	0.85	0.74	0.69
4		0.70	0.72	0.82	0.75
5		0.50	0.56	0.67	0.74
PIP 2		0.77	0.70	0.72	0.72
3		0.78	0.87	0.71	0.68
4		0.75	0.75	0.75	0.82
5		0.73	0.68	0.78	0.87
IP 1	0.75				
MCP 1	0.82	0.28	0.21	0.01	0.06
2	0.23	0.92	0.68	0.17	0.13
3	0.09	0.67	0.91	0.24	0.19
4	0.03	0.09	0.15	0.57	0.70
5	0.06	0.13	0.19	0.70	0.81
CMC 1	0.71				
Knee ---			0.80		
Hip ---			0.59		

many patients, and of metacarpophalangeal and carpometacarpal joints of the left thumb produced minimal interference. No record was kept of handedness of the patients. Involvement of the third, fourth, and fifth right proximal interphalangeal joints, the cervical spine, or the shoulders, also produced transient interference with activities of daily living.

TABLE 4. KNEE INVOLVEMENT ALSO CORRELATES WITH ADVANCING AGE, SUGGESTING THE POSSIBILITY THAT AT THIS JOINT, AT LEAST, DEGENERATIVE CHANGES RELATED TO AGING MAY BE OPERATIVE AS WELL. HOWEVER, INVOLVEMENT OF OTHER JOINTS IS NOT CORRELATED WITH AGE

	Knee
Age of patient	Right 0.49
	Left 0.40

Fifty-one per cent of the patients were treated with physical measures at some time, including paraffin dip baths, moist heat, and therapeutic exercise programs, and 65 per cent were treated with intra-articular injections of corticosteroids, usually into rapidly enlarging finger joints or into knees.

Six per cent had received estrogen therapy, and 7 per cent other hormonal therapy preceding onset of symptoms. All of these patients were either well past menopause by age, or in the case of younger patients, by virtue of panhysterectomy.

Most patients were already taking various drugs for control of symptoms at the time they were first seen. Changing drug therapy was necessary in many, but the majority were able to discontinue taking medications within three to four weeks of their initial visit. Subsequently, the more distressing symptoms were controlled through short intermittent courses of analgesic and anti-inflammatory medication and intra-articular injections of corticosteroids. Fifty-nine per cent of the patients took aspirin, either alone or in combination with anti-inflammatory drugs, with limited effectiveness. At some time, 54 per cent took indomethacin, and 28 per cent phenylbutazone, with apparently good relief of pain. Twelve per cent had taken corticosteroids before their first visit; these compounds were successfully discontinued in all.

Erythrocyte sedimentation rate, measured by the Westergren method, came within the normal range of 20 mm per hr or below in 43 per cent; in 36 per cent, modest elevations to between 20 and 40 mm per hr were recorded; in 14 per cent, elevations ranged between 40 and 60 mm per hr and in 7 per cent, values above 60 mm per hr were recorded. Most of the highest values occurred during the development of rheumatoid arthritis in some of the patients. Latex fixation tests for rheumatoid factor were negative in 96 per cent, weakly positive (1:40 or less) in 4 per cent. Uric acid registered below 6 mg per cent in 71 per cent and above in 29 per cent. Hemoglobin registered above 12 gm per cent in 77 per cent, and below in 23 per cent.

Roentgenograms of the joints were obtained in 76 patients; erosions were evident in almost all, with multiple erosions in 40, and predominantly degenerative changes with an occasional small erosion in 36. All roentgenograms revealed the features usually associated with osteoarthritis as well: narrowing of joint spaces, marginal osteophyte formation, and joint reshaping.

In 144 cases, the inflammatory signs subsided, leaving behind residual nodose deformities without marked disability of the appropriate joints. In 26 cases (15 per cent), an indolent syndrome indistinguishable from rheumatoid arthritis superimposed itself during the period of observation.

#### DISCUSSION

Acuteness of onset of arthritis plus the Galenic quintet of manifestations—swelling, pain and tenderness, overlying redness, warmth, and some limitation of function—

suggested the term *inflammatory osteoarthritis* to describe these manifestations. The definition is based on clinical presentation rather than on roentgenographic or histologic characteristics. The syndrome sets in, predominantly in women, at a mean of 50.5 yr of age. It begins with development of painful red nodules of the distal and proximal interphalangeal finger joints of abrupt onset, eventuating after a variable course, in nodose degenerative lesions of these and other small joints of the hand, with or without similar involvement of other joints. The initial lesion clearly suggests synovitis, with marked redness of the overlying skin, edema, and tenderness of the joint, and restricted motion. The interphalangeal and metacarpophalangeal joints of the thumb frequently develop the characteristic garlic-clove deformities, stubby in appearance, slightly flexed at both the metacarpophalangeal and interphalangeal joints. Frequency of involvement of metacarpophalangeal joints declines precipitously from the first to the second, and from the second through the remainder. In many patients, the fingers become gnarled, resembling the trunks and branches of olive trees, with lateral-medial instability leading to deviation of one phalanx on another (Fig. 2). After initial pain in the anatomic snuff box, that area at the base of the first metacarpal becomes angular, giving the whole thenar eminence a squared appearance. Instability as well as nodose deformities at the interphalangeal joints are a frequent end result though pain and disability may be minimal.

Even more distressing than pain during the active phase of this disorder are the throbbing paresthesias of the finger tips. The pulp at the finger tips becomes engorged and red, particularly at night, and may awaken the patient from sleep. The patient feels compelled to shake the hand vigorously, and this movement seems to relieve the symptoms somewhat.

Stiffness in the mornings and after other periods of rest is obviously of relatively short duration (usually up to one-half hr) and commonly described as remediable by motion, exercise, and moist heat. Stiffness is not generalized, but rather afflicts the hands and other joints that may be involved.

We have depicted the increased heat at the appropriate joints by thermography [8], though brachial angiography has failed to confirm the expected increased vascularity.

In the present series, the small joints of the right hand were involved more frequently than those of the left. On both hands, as others have noted [9], the second distal interphalangeal joint was most commonly at risk, with the fifth distal interphalangeal joint a close second. All the distal interphalangeal joints were involved more frequently than any other joints in the hands. The proximal interphalangeal joints were each involved in approximately half the patients, and the first carpometacarpal joint next most commonly involved in 37 per cent of right hands and 36 per cent of left. The interphalangeal joint of the thumb became involved in approximately a third, and the first metacarpal joint in approximately a quarter of the patients. While most previous authors took pains to deny involvement of other metacarpophalangeal joints, 13 per cent of the present group developed the lesion in the right second metacarpophalangeal joint and 11 per cent in the left second metacarpophalangeal joint, 7.6 per cent in the right third metacarpophalangeal joint and 6.5 per cent in the left, and 2 per cent in the right or left metacarpophalangeal joint, or the left fifth, and 1 per cent in the right fifth metacarpophalangeal joint. In the lower extremities, 40.6 per cent of patients developed left knee involvement to 38 per cent of the right, and 16.5 per cent left hip involvement to 14 per cent of the right, reversing the side



Fig. 2. Characteristic late appearance of inflammatory osteoarthritis, with deviation of individual phalanges either radial or ulnar, Heberden's and Bouchard's nodes, and garlic-clove enlargement of the interphalangeal joints of the thumbs. Note also the squaring of the thenar eminences because of involvement of the first carpometacarpal joints.



Fig. 3. Erosive lesions, narrowing of the joints, and marginal osteophytes are characteristic of inflammatory osteoarthritis. Note particularly lesions at distal interphalangeal joints, the third right distal interphalangeal joint is ankylosed.

of predilection in the hand (Table 5). The cervical spine was involved in 27 per cent and other joints, randomly distributed, including shoulders, manubriosternal, lumbosacral apophyseal joints, metacarpophalangeal joints, and ankles in 75 per cent. In these patients, it was clinically impossible to distinguish between pain resulting from first carpometacarpal involvement or from involvement of the adjacent trapezioscapoid joint; the localization is best made roentgenographically. It is noteworthy that none of the patients developed osteoarthritis in the distal radioulnar joint or changes beyond the ulnar head, unlike rheumatoid arthritis, in which the ulnar aspect of the wrist is so commonly involved as to constitute a diagnostic feature [10].

The pattern of involvement in the joints of the hand differs considerably from that reported by Stecher [4] in his analysis of 100 cases of idiopathic Heberden's and Bouchard's nodes. In fact, only at the second distal interphalangeal joints are the percentages even close, Stecher recording 85 per cent in the right second distal interphalangeal joint and 86 per cent in the left second distal interphalangeal joint. In his cases, the third distal interphalangeal joint was almost as much at risk, the fifth distal interphalangeal joint considerably less and the fourth much less even than the fifth. Only half as many patients as in the present series had involvement of proximal interphalangeal joints and no patients had involvement of any of the metacarpophalangeal joints. The greater and more widespread involvement in the present series suggests obvious differences in severity between the benign idiopathic nodose changes and those accompanied at onset by inflammation.

Coefficients of correlation suggest a remarkable association of involvement of adjacent distal or proximal interphalangeal joints, and almost as much likelihood of involvement of interphalangeal joints separated by an uninvolved joint. There is also a high degree of concurrent involvement of the same joints on each side. The statistics thus suggest that this syndrome is characterized by symmetry to a degree hitherto unappreciated. Not surprisingly, there is also considerable correlation between the age of the patient and knee involvement; the older the patient, the more distressing this feature becomes.

TABLE 5. FREQUENCY OF JOINT INVOLVEMENT (170 PATIENTS)

1. Right 2nd DIP	(141)	19. Right 1st CMC	(65)
2. Right 5th DIP	(135)	20. Left 1st CMC	(62)
3. Left 2nd DIP	(132)	21. Right 1st IP	(60)
4. Right 3rd DIP	(127)	22. Left 1st IP	(49)
5. Left 5th DIP	(124)	23. Right 1st MCP	(47)
6. Left 4th DIP	(124)	24. Cervical Spine	(46)
7. Left 3rd DIP	(123)	25. Left 1st MCP	(41)
8. Right 4th DIP	(122)	26. Left Hip	(28)
9. Right 2nd PIP	(90)	27. Right Hip	(24)
10. Right 3rd PIP	(89)	28. Right 2nd MCP	(22)
11. Left 5th PIP	(88)	29. Left 2nd MCP	(19)
12. Left 4th PIP	(88)	30. Right 3rd MCP	(13)
13. Right 4th PIP	(87)	31. Left 3rd MCP	(11)
14. Left 2nd PIP	(86)	32. Left 4th MCP	(4)
15. Right 5th PIP	(85)	33. Right 4th MCP	(3)
16. Left 3rd PIP	(84)	34. Left 5th MCP	(2)
17. Left Knee	(69)		
18. Right Knee	(65)		

Twenty-six of the patients who presented with all the requisite features of this syndrome and initially seemed no different gradually developed supervening synovitis, predominantly at the ulnar aspect of the wrists, progressing to caput ulnae syndrome, characteristic of rheumatoid arthritis [10]. In all cases, there was an interval during which established osteoarthritic changes remained but few symptoms were noted, followed by what seemed now to be rheumatoid arthritis. The further course of these, including development of serologic abnormalities, will be analyzed in detail in a subsequent publication.

The majority of patients presented with a predominantly normal laboratory profile. Erythrocyte sedimentation rates came within normal range, or only slightly above it, in most, with higher values recorded predominantly in those converting to rheumatoid arthritis. As would be expected, therefore, latex fixation tests for rheumatoid factor were negative in almost all, and positive in low, undiagnostic titers (1:40 or below) in only a small percentage (4 per cent). Similarly, hemoglobin remained at or near normal levels in the majority. Uric acid was normal in 71 per cent but elevated above 6 mg per cent in 29 per cent; this fraction probably included some patients whose uric acid rose in response to small doses of salicylates taken to abort some of the symptoms of this disorder.

Initially, we did not routinely obtain roentgenograms, as we felt confident enough of the diagnosis on clinical grounds, supported by negative laboratory findings, to omit them. Lately, we have added roentgenograms to the routine work-up even though the patients are seen in consultation and subsequent follow-up and not as part of an epidemiologic survey, because of the apparent conversion of a significant number of these cases to rheumatoid arthritis. Thus, only 76 roentgenograms were available for review. Osteophytes accompanied by marked erosive changes, as described by Kidd and Peter [11], were present in more than half, the remainder showing narrowing and proliferative changes, with minor erosive changes scattered among the various joints. Roentgenographic abnormalities were compatible with the diagnosis of erosive osteoarthritis or primary generalized osteoarthritis.

In most instances, the lesions of the various finger and hand joints combine erosive and proliferative osteoarthritic features (Fig. 3). Though the interrelationship of the nodose lesions of the fingers seems well established clinically and statistically, the association of remote osteoarthritic symptoms need not necessarily imply causal relationship. The *neck* lesions are predominantly osteophytic spurring of the apophyseal joints and disc degeneration. Osteoarthritis at the *hips* develops either medially or superiorly. At the *knees*, however, lesions bear the closest resemblance to the finger lesions roentgenographically. Nevertheless, a distinct correlation between knee lesions and advancing age (Table 4) suggests that use and abuse of these joints is an important factor in the pathogenesis of the lesions, though the data offer no clue as to the initial process. Despite the symmetry and generalized nature of this syndrome, the relationship of the various lesions may well rest on chance or factors related to aging.

Distribution of the lesions of osteoarthritis and their diagnostic assignment has lately interested several groups. The New Haven survey of joint diseases is perhaps the most complete such assessment [12]. As an epidemiologic study, it is predominantly a roentgenographic and laboratory survey, though clinical features are described. However, the cases of abrupt seemingly inflammatory onset are not clearly separable

from those representing merely the benign osteoarthritis. The series has thus yielded the valuable information that the belief by respondents that they have arthritis is closely related to the actual occurrence of arthritis [13]. Women tended to have more severe and more frequent osteoarthritis than men, and the disease had a centrifugal distribution within each hand. Our present series conforms to this latter pattern also confirming the distribution on the radial side of the hand of the lesions that was reported, though not stressed, in the New Haven survey.

Public Health data [14] suggest that osteoarthritis is the rule, not the exception among those of older ages, occurring earlier in women than in men. Other studies have concluded that morning stiffness is so common in osteoarthritis as not to be usable as a diagnostic sign for rheumatoid arthritis; however, only the occurrence and duration, not the degree and distribution, were stressed in such studies and may well be that morning stiffness can yet, by more careful definition, be salvaged as a differential characteristic. Occupation may be a factor in the production of osteoarthritis, but neither race nor economic status seems to be of much importance [14]. Generalized osteoarthritis has been reported in similar proportions from various parts of the world, though most of the epidemiologic data were obtained in the United States and the United Kingdom.

Philip Wood [15] has provocatively asked whether it makes sense to speak of disorders of the locomotor system. He quite properly points out that the term implies a unity, which has some meaning when discussing total physiologic kinetics and anatomy, for example. However, with the advent of disease, one may be confronted by the complexity of multilocus involvement. A simple dichotomization, such as *yes* or *no*, can be applied to a single organ or to organs that function as a single unit, is not possible. He points out that taxonomic concepts, to be valid, should suggest the appropriate treatment and the likely prognosis, and should be etiologically meaningful. The diagnosis of rheumatoid arthritis, applied to what usually is a systemic disease, fails to satisfy these criteria in all three areas; it is hardly surprising that osteoarthritis other than as a description for local changes, should fail completely to find validity as a disease entity. Where definitions are fluid, a desire for concrete data has led to search for measurable evidence—"portable data". Thus, the terms 'rheumatoid arthritis' and 'osteoarthritis' may be differently interpreted by epidemiologists, pathologists, roentgenologists, and clinicians. Wood calls for greater consideration focused on subjective complaints.

The present study, while not an epidemiologic survey, has attempted to refine the clinical description of a variety of osteoarthritis encompassed by the term inflammatory osteoarthritis, in which the symptoms are of abrupt onset and general eventuate in changes of the joint not perceptibly different from benign osteoarthritis. In focusing on this select list of *propositi*, based on their subjective complaints, it is not surprising that the percentage of involvement of a given joint is appreciably larger in the current series than in epidemiologic surveys that do not make this distinction.

The family history was obtained, in most cases, through questioning of the patients. Though 68 per cent of the patients claimed such a history, the figure is undoubtedly conservative, as an affirmative answer to the question was never accepted until the disease, including its mode of onset, distribution, and eventuation, in the supposed cases, was carefully ascertained. As a result, incomplete knowledge of the symptoms disqualified many a possible case of osteoarthritis in a relative, and premature death

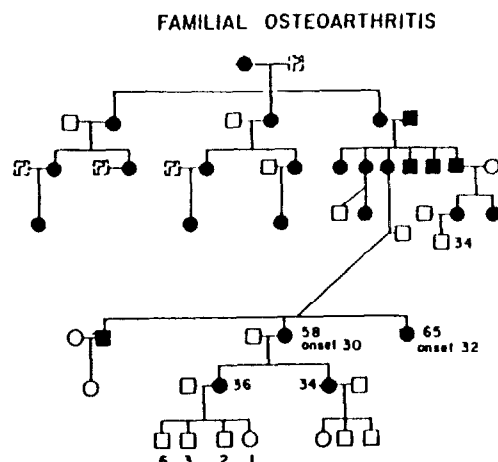


FIG. 4. Occurrence of inflammatory osteoarthritis in one family. Mendelian dominant heredity is suggested. Circles represent women, squares men; numbers are current ages of appropriate individuals. Note that all direct-line members of the family share the syndrome, except when they are yet too young to have developed it.

of a significant relative or ignorance probably eliminated many another. The pedigree of one family with well documented inflammatory osteoarthritis is included (Fig. 4). Two of the members of the family form part of the present series; for the remainder, extensive medical histories, photographs, and, in many cases, roentgenograms were made available, to permit inclusion or exclusion as exemplars of this disorder.

The German concept of rheumatoid arthritis engrafted upon osteoarthritis called *Pfropf-pcP* (Graft-RA) [16] has some appeal as relating, if not explaining, the superimposition of an indolent form of rheumatoid arthritis on osteoarthritis. A significant proportion of the present series (15 per cent) eventuated in this manner, and will be analyzed and reported separately. Of five patients who developed ankylosis of distal and proximal interphalangeal joints—similar to the cases reported by McEwen [17]—four developed superimposed rheumatoid arthritis.

The marked preponderance of involvement of finger joints over other joints is implicit in the definition used for this syndrome. If examples of this disorder exist that spare the finger joints, they would most assuredly have been missed through selectivity.

### CONCLUSIONS

Inflammatory osteoarthritis is *abrupt* in onset, characterized by painful nodose lesions of interphalangeal joints, metacarpophalangeal joints of the radial aspect of the hand, intercarpal and carpometacarpal articulations at the base of the thumb (rhizarthrosis), accompanied in many cases by knee, hip, cervical spine, and assorted other joint and tendon lesions. Women of menopausal age are the chief victims, especially when a family history exists. The arthritis is remarkably symmetrical, with redness overlying the joints, and throbbing paresthesias, particularly at night, as the most distressing symptom. Stiffness in the mornings and after other periods of rest is generally brief and can be alleviated by exercise and moist heat. It is generally confined

to afflicted joints. No specific laboratory features can be expected, but roentgenogram generally show erosive changes as well as narrowing of joints and marginal bone proliferation. Most analgesics provide temporary beneficial results, and intra-articular instillation of corticosteroids can significantly reduce swelling, redness, and pain. Prognosis is relatively good, the disease generally becoming asymptomatic in a few years, though nodose deformity and malalignment of the joints frequently eventuate. Crippling is unlikely except in the more severe cases involving the knees, though minor interference with activities of daily living may transpire. In the present series of 170 patients observed up to five years, with a mean duration of disease of ten years, 15 per cent developed a relatively localized indolent form of joint disease indistinguishable from rheumatoid arthritis.

### SUMMARY

In erosive or interphalangeal osteoarthritis or primary generalized osteoarthritis there are usually inflammatory phases. The correlation matrix for the various manifestations of 170 cases helped define the syndrome. A remarkable symmetry was noted, not only in the expected distal and proximal interphalangeal joints but also in metacarpophalangeal and carpometacarpal joints, knees, and hips. Confusion with sero-negative rheumatoid arthritis must be avoided. Erosive changes develop in almost all cases, and at the knees, may lead ultimately to disability. In the hands, the pattern is centrifugal and radial in distribution. This clinical syndrome is often familial, and ultimately resembles the benign variety of Heberden's and Bouchard's nodes; the acute onset and the involvement of more proximal joints of the hands and of a pattern of peripheral and spinal joints permit its differentiation. In 15 per cent of the cases (26 patients), superimposition of an indolent variety of rheumatoid arthritis usually beginning in the wrists, developed.

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## INDICES OF RELATIVE WEIGHT AND OBESITY

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### [INTRODUCTION]

THE NEED for an index of relative body weight was recognized from the beginning of anthropometry, that is to say as soon as serious attention was given to the dimensions of the body and their biological and medical implications. Body weight in proportion to height or to some function of height is interesting because it should indicate something about 'build' or shape and about obesity or fatness.

Various indices of relative weight have been espoused and applied for many years but as yet there is no agreement on any particular index. In part this reflects confusion—or at least lack of agreement—about what a relative weight index should represent and mean; in part the reason is a lack of "calibrating" data and of systematic examination of wide-ranging samples of data analyzed in parallel. The purpose of this paper is to provide a comparison of various indices of relative weight as applied to data on weight, height and body fatness of men in several countries in Europe, in Japan, and in South Africa, as well as of white men in the United States.

In the present paper guidance in the analysis was provided by two assumptions. First, it is assumed that a major reason for the use of a relative weight index is to remove the dependency of weight on height. Second, it is assumed that in the selection of an index attention should be given to the degree to which the index may indicate relative obesity or body fatness.

### RELATIVE BODY WEIGHT—LIFE INSURANCE AVERAGES

Superficially, it might seem simplest and most informative to express the weight of the individual as a percentage of the average weight of persons of the same height, age and sex in the population to which he belongs. That was the reasoning that led to the publication of "standard height-weight" tables by the life insurance industry, beginning with the Medico-Actuarial Mortality Investigations of 1912 [1].

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